Effect Of Cultivar, Time Of Sowing And Fungicide Application On Seed Yield Of Cocksfoot (*Dactylis glomerata* L)

A thesis presented in partial fulfilment of the requirements for the degree of Master of Agricultural Science in Plant Science (Seed Technology) at Massey University, Palmerston North, New Zealand

Sonya M. Wilson

1995

ABSTRACT

Three New Zealand (Grasslands Wana, Grasslands Kara, Grasslands Tekapo) and two Japanese (Akimidori, Makibamidori) cocksfoot cultivars were sown in spring (23 September 1991) and again the following autumn (6 April 1992) at AgResearch Grassland's Aorangi Research Farm in the Manawatu. Seed was sown at 3 kg/ha with a 30 cm row spacing. Plot size was 1.2 x 3.0 m^2, with each plot containing 4 rows. A randomised block design was utilised with 8 replicates of each cultivar for each sowing time. For each cultivar and sowing time four of the eight replicates were sprayed with propiconazole (125 g a.i./ha) on 17 November 1992 and 8 December 1992. Spring sowings outyielded autumn sowings by 150 to 482 kg/ha depending on cultivar. The ability of the spring sown cultivars to outproduce autumn sown cultivars was due largely to their ability to produce a greater number of fertile tillers. Autumn sown cultivars failed to produce a large number of fertile tillers which lead to a reduced potential seed yield. This was further exaserbated by the fact that the floret site utilisation (FSU) of the autumn sown cultivars was lower than that of the spring sown cultivars. Cultivar Wana was the only cultivar able to produce a reasonable number of fertile tillers following autumn sowing. It was also able to double the number of florets/tiller compared to that of spring sown cv Wana, thus allowing it to produce a reasonable seed yield. Cultivar Wana produced 557 kg seed/ha from the autumn sowing, and cv. Tekapo 244 kg seed/ha, but yields for the other three cultivars were less than 100 kg/ha following autumn sowing. Spring sowing produced pure seed yields of 707, 566, 593, 383 and 307 kg/ha for cv. Wana, Tekapo, Kara, Akimidori and Makibamidori respectively. Apart from cv Wana, fungicide application to autumn sown plots did not significantly increase seed yield, and similarly no differences were recorded for spring sown cv Akimidori and Makibamidori.

However fungicide application significantly increased seed yield in cv Wana, Kara and Tekapo, the increases being 521 (+ 74%), 119 (+ 21%) and 564 (+ 95%) kg/ha respectively, even though the incidences of fungal pathogens was less than 1%. These seed yield increases were due to an increase in the green area of the leaves and stem. In cv Wana and Tekapo there was also a significant increase in FSU due to the application of fungicide.

Following harvest stubble was removed and the area retained for another year and subsequent harvest. As the effects of time of sowing were considered no longer significant, the trial was run as one block of 80 plots, thus giving 16 replicates of each cultivar. For each cultivar, four replicates received one of four different fungicide (188 g ai/ha of terbuconazole) treatments; a nil application, one application at approximately 10% ear emergence, one application at approximately 10% ear emergence followed by another at early anthesis and one application at early anthesis followed by one post anthesis (10 days after full anthesis).

In the absence of fungicide pure seed yields produced were 1133, 1208, 915, 556 and 671 kg/ha for cv. Wana, Kara, Tekapo, Makibamidori and Akimidori respectively. Although once again the incidence of fungal pathogens was less than 1%, fungicide increased the seed yield of all cultivars. The best results came from two applications of fungicide, one at ear emergence and one at anthesis. The exception to this was for cv Tekapo which gained the greatest increase from one application at ear emergence. These treatments increased the pure seed yield by 29%, 15%, 23%, 43% and 19% for cv Wana, Kara, Tekapo, Makibamidori and Akimidori respectively. Different cultivars reacted differently to the application of fungicide, with fungicide significantly increasing the thousand seed

weight of cv Kara, Tekapo, Akimidori and Makibamidori, although it had no such effect on cv Wana. Fungicide application increased the FSU of cv Wana and Tekapo but did not significantly affect cv Akimidori, Makibamidori and Kara. Cultivars Wana and Makibamidori showed a significant association between green area and seed yield, but these relationships were not significant for the other three cutivars. There was a significant association between FSU and seed yield after fungicide application for all the cultivars except cv Kara. The most cost effect return for the application of fungicide was that of a single application at ear emergence.

Keywords: Cocksfoot, *Dactylis glomerata*, rust, eyespot, propiconazole, terbuconazole, fungicide, sowing date, cultivar.

ACKNOWLEDGEMENTS

There are many people to whom I owe my thanks and deep gratitude for their help in production of this thesis:

My family and friends who have given me untold support throughout the duration of this Masterate, and probably all deserve medals.

Professor Murray Hill, for believing in my ability to do this degree from the start and his constant support throughout. Dr Phil Rolston, for helping me get the trial off the ground. Associate Professor John Hampton, for his supervision, guidance and support throughout this degree, and especially in the preparation of this thesis.

Craig McGill, for his help in my battle with statistics. Robert Southward and Colette Gwyne who were always available with helping hands. The Wana Cocksfoot Seed Growers Association for their much needed financial support, Alan Johnson at the MAF Seed Testing Station for some valuable information used in this thesis, and AgResearch Grasslands for providing the trial site and technical assistance.

Dr Syd Easton who has provided me with a great deal of support and encouragement throughout the writing up of this thesis. Helen Dick and Joanne Morris who helped me with the finishing touches in this thesis.

Finally, a big thanks to Karen Hill and Ruth Morrison whom, apart from their support and practical assistance, managed to keep me on the straight and narrow while studying at the Seed Technology Centre.

To all these people; I couldn't have done it without you.

Sonya M. Wilson.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES